ADJUSTABLE WIDTH EXCAVATOR BUCKET

Field of the Invention

The invention relates to buckets for excavators, and in particular to a bucket the width of which can be adjusted. Such a bucket is particularly, but not exclusively useful when attached to an excavator or the backhoe of a backhoe loader.

Background of the Invention

Backhoes and excavators are used to dig trenches. The width of trenches to be dug depends on the purpose of the trench. For example, if the trench is being dug in order to lay a telephone cable, the trench need not be as wide as a trench being dug to lay a foundation, or a surface water drain pipe.

To date, excavators have been provided with a number of different buckets each having a different width. When a trench of a different size is required, the bucket must be changed to the bucket whose width most closely matches the desired width of trench.

The requirement to change buckets, and to use a bucket of defined width presents a number of problems. First, it is necessary to buy a number of buckets, which is costly. Second, it is necessary to transport the different width buckets from site to site. Third, on building sites, when it is necessary to change the bucket, the vehicle must traverse the site to the location of the buckets, which wastes time and can cut up the site in wet conditions. Fourth, changing the buckets takes time and is a potential source of accidents (pins holding the bucket to the arm of the excavator are changed manually, and often buckets will not be stored on level sites, thereby requiring manual effort lever the bucket into a position where the holes in the bucket and arm of the excavator are aligned so that holding pins can be securely located in position). Fifth, the fact that buckets are of a defined

width, means that trenches can only be dug to match the particular bucket widths, resulting in some unnecessarily wide trenches being dug.

So far, attempts made to overcome some of the above-mentioned problems have concentrated on simplifying the attachment and release of buckets to the arm of the excavator. Whilst such systems do reduce the time taken to change buckets, and remove the need for personnel to be in the region of the bucket during change over, thereby reducing the potential for accident, many of the above-identified problems are not addressed.

The invention therefore seeks to provide an improved excavator bucket.

Summary of the Invention

According to the invention there is provided an adjustable width excavator bucket as specified in Claim 1.

One aspect of the invention provides a manual mechanism for adjusting the cutting width of the bucket.

Another aspect of the invention provides a remotely operable actuator for adjusting the cutting width of the bucket.

The adjustable width excavator bucket of the invention provides numerous benefits. First, it is not necessary to purchase or transport from site to site numerous buckets of different widths. Second, when on site, it is not necessary to change bucket to match a particular job, thereby removing downtime associated with moving the vehicle to the location where the desired bucket is stored and with changing the bucket. Also, the risk of accident during changing from one bucket to another is removed. Third, expensive systems for automatically coupling and uncoupling buckets to the excavator arm can be dispensed with, since the necessity to change buckets frequently will be

removed. Fourth, any cutting width between respective maximum and minimum cutting widths can be selected, thereby avoiding the need to dump excess spoil or pour unnecessarily large volumes of concrete.

Brief Description of the Drawings

In the drawings, which by way of example, illustrates embodiments of an adjustable width excavator bucket:

Figure 1 is a schematic representation of an excavator bucket according to one aspect of the invention;

Figure 2 is a plan view of the excavator bucket illustrated in Figure 1;

Figure 3 is a side view of the excavator bucket illustrated in Figures 1 and 2;

Figure 4 is a front view of the excavator bucket illustrated in Figures 1 to 3, with the sides of bucket parallel; and

Figure 5 is a side view of a bucket according to a second embodiment of the invention.

Detailed Description of the Preferred Embodiments

Referring now to Figure 1, there is shown an excavator bucket 1 comprising planar side walls 2 and a back plate 3, which includes a substantially arcuate portion 6 and a substantially planar portion 6a. The bucket is attachable to an arm of an excavator by means of a bracket assembly comprising a pair of spaced apart plates 12, each comprising apertures 13 through which pins can be passed to secure the bucket 1 to the excavator arm. The plates 12 are welded to the back plate 3.

On a front edge of each side wall 2, there is mounted a hinge 7. Also mounted to each hinge 7 is a variable width member comprising a side plate 4 and a base plate 5 connected substantially at

right angles to one another. As can be seen from Figure 1, it is an edge of the side plate 4 that is attached to the hinge 7. The side and base plates 4, 5 each have a free edge 4a, 5a, which in use comprise part of the cutting edge of the bucket. The base plates 5 extend beneath the substantially planar section 6a of the back plate 3, the lower surface of the said planar section 6a touching or being in close relation to the upper surface of the base plate 5. Attachment members 8 fixed to the inner surface of the side plates 4 are connected to a mechanism for varying the width of the bucket which shall be described in greater detail in relation to Figure 2.

Referring now to Figures 1 and 2, a width adjustment mechanism M comprises a pair of spaced apart plates 9 connected one to another by a web 16. Mounted rotatably in the web 16 is an externally threaded bar 15, which passes through an aperture in the back plate 3 of the bucket. An internally threaded nut 14 is axially aligned with the afore-mentioned aperture, and fixed to the back plate 3, for example by welding. By rotating the threaded bar 15 the distance between the plates 9 and the back plate 3 can be varied.

The mechanism M further comprises arms 8, one end of each arm being located between the said plates 9, and pivotally connected to a respective pin 10 which passing through apertures in the plates 9 and the arm 8. An edge 11 of each arm 8 is connected to the inside of one of the side plates 4, for example the edge 11 of an arm 8 may be welded to the inside of a side plate 4 in front of the hinge 7. In the example shown in Figure 2, the apertures in the plates 9 and the arm 8 are larger than the pin 10, and are sufficiently large to accommodate a bearing in the form of a bush 12 that surrounds the pin 10. The bush may be made of a compressible material such as rubber, in order that shock loads experienced during a digging operation are attenuated, rather than being transmitted directly to the other components of the mechanism M. In place of the bush 12, other suitable bearings could be used.

Each arm 8 further comprises a cam surface 13. The distance between the centres of the pins 10 located in the plates 9, and the shape of the cam surfaces 13 of the respective arms 8 is such that the cam surfaces touch each other.

In use, when the operator wants to change the cutting width of the bucket, he attaches a tool to, and then rotates, the threaded bar 15. As mentioned above, rotating the threaded bar 15 moves the plates 9 towards and away from the back plate 3. The arms 8 are fixed to the side plates 4, which are in turn pivotally attached to the side walls 2. Moving the plates 9 away from the back plate therefore causes the arms to pivot around pins 10, and a corresponding pivoting motion of the side plates 4, thereby adjusting the width between the cutting edges of the side plates 4.

Referring again to Figure 2, it can be seen that the axes of the hinges 7 lie in a plane forward of the plane in which the axes of the pins 10 lie. This is so that as the bucket digs, the force on the cutting edges 4a and 5a cause the ends of the arms 8 located in the mechanism M to be pushed together, and therefore the cam surfaces 13 to be pushed together. In this way the load is carried largely by the arms 8, the hinges 7, the side walls 2, and the side plates 4, rather than the mechanism M itself.

With the bucket 1 configured to provide the narrowest cutting width respective side plates 2 and 4 are aligned, and the side plates 4 of opposing sides of the bucket are substantially parallel. As shown by the broken line illustrating the edge of the base plates 5, in the narrowest cutting width configuration, the parallel free edges of the base plates 5 touch one another. The arrow X illustrate movement of a side plate 4 and its attached base plate 5 to a wider cutting width.

From Figure 3, the position of the threaded bar 15 and the nut 14 can be seen. The bucket 1 is attached to the arm of an excavator by suitable pins passing through the apertures 13 and corresponding apertures in the excavator arm. The position of the threaded bar 15 is such that it is easily accessible for adjustment of the bucket width.

Figure 6 illustrates a second embodiment of the invention in which the threaded bar 15 and nut 14 are replaced by a double acting short stroke hydraulic ram 20 powered by the hydraulic system of the excavator vehicle. Hydraulic fluid is delivered to the ram 20 through hydraulic hoses 21 and 22. The mechanism M is otherwise substantially identical to the mechanism M described with reference to Figures 1 to 5.